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west virginia department of environmental protection


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**MEMORANDUM**

**To:** Beverly McKeone, P.E., NSR Program Manager

**From:** Ed Andrews, P.E., Engineer 

**Date:** February 7, 2017

**Subject:** PD17-009 for FMW Composite Systems Inc. – Bruceton Mills 077-00091

On January 30, 2017, FMW Composite System, Inc. (FMW) filed a permit determine request for their Electrode Induction Gas Atomization (EIGA) process and plasm arc cold-hearth melting furnace (PAM) process. FMW uses the PAM to produce titanium round bar to be used as a feedstock for the EIGA process. The finish product from the EIGA is a titanium powder that used in plasma spray applications. This titanium powder is used in the aircraft manufacturing and remanufacturing industries.

The PAM process uses titanium sponge and alloying elements to produce a titanium alloy round bar. These alloying elements include chromium, and nickel, which are classified as hazardous air pollutants (HAPs). FMW identified four products produced by the PAM process with a total cycle time of 7 hours. Of the 7 hours, FMW believes emissions are only released during the melting and casting phases of the process, which takes about 3 hours per cycle and annualized to 3,754 hours per year.

The actual plasm arc is shield with helium and cooled with a continuous purge of argon gas to prevent impurities being created in the Ti alloyed round bar (i.e. oxides). Thus, products of combustion and incomplete combustion should not be generated. The potential emission from the process are in the form of particulate matter (PM). PM less than 10 micros (PM10), PM less than 2.5 micros, and metal HAPs (i.e. chromium and nickel).

FMW used to Antoine's Equation with corresponding constants for the respective alloying elements to determine the vapor pressure of the individual components of the round bar. Using the vapor of the respective component, FMW calculated the mole fraction of the vapor phase of each individual component and mass rate. Based on these calculation, Product 1 (Ti/Al alloy) has the greatest potential for PM and HAP metal emissions of 0.52 lb of PM per hour and 0.02 pounds of chromium per hour. FMW using particle size distribution table from Chapter 12 of AP-42 to determine the PM<sub>2.5</sub> and PM<sub>10</sub> fractions., which are 0.35 pounds of PM<sub>2.5</sub> per hour and 0.48 pounds per hour.

Like the PAM process, the emissions from the EIGA process are in the forms of PM, PM 10, PM2.5, and HAP metals. FMW using process data (maximum feed rates) to determine the actual maximum mass production rate to be used to determine the potential emissions from the process.

Emissions calculations are based upon AP-42 methodology, however FMW's titanium atomization operations are not adequately described by any of the categories of Table B.2-1. of Appendix B.2 of AP-42. Detailed particle size analyses of FMW powder are known from sieve analysis [ASTM B214] and light scattering [ASTM B822].

A particle size distribution of powder collected post-cyclone is shown in Figure 1. This curve was obtained from the average several runs during argon recycling commissioning. The powder collected post-cyclone is fairly coarse compared to the desired product collected in the atomization can. The high-efficiency cyclone was designed specifically for collect a specific particle size of titanium powder.

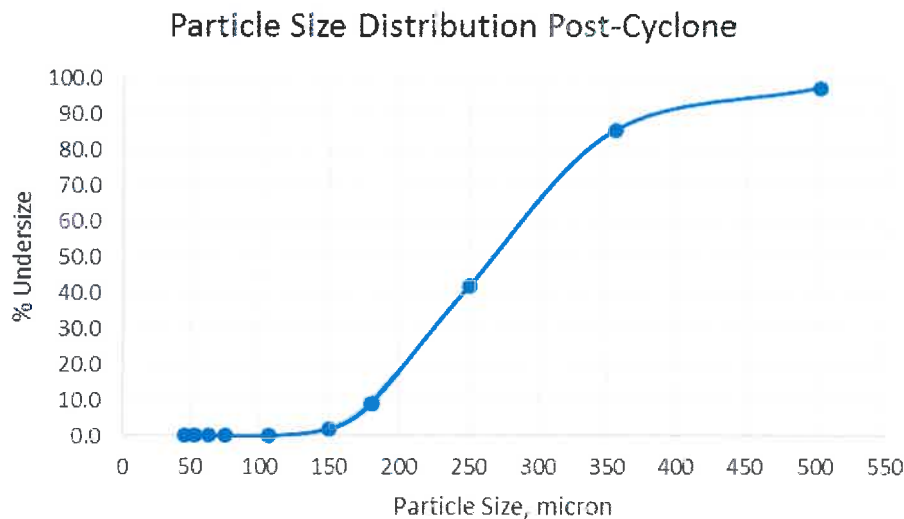


Fig. 1: Particle Size Distribution of Post-Cyclone Powder

Based on the results of five particle size sampling run down stream of product recovery device, the particle size collected were 106  $\mu$  or larger. Thus, the particles emitted from the EIGA with the argon gas does not meet the definition of PM, PM<sub>10</sub> or PM<sub>2.5</sub>.

FMW determined that the mass of the total particles loss to the atmosphere to be 1.8 pounds per hour. Using the specific alloy with the highest percentage of HAPs (NiTi), the potential of HAP metal emissions is 0.72 pounds of nickel per hour.

These particles are vented to the atmosphere with the argon gas. In the future, FMW plan to make a process changes to recycle the argon gas and scrub out the particles with a HEPA filter

system. Because this titanium powder is use in the aircraft industrial, the process change must be evaluated and approved by the FAA before FMW. Thus, the emissions were evaluated based on the current configuration of the process.

The following table is the summary of potential emissions from the two processes.

Table 1 – Summary of PTE from PAM and EIGA					
Pollutant	Emission from PAM		Emission from EIGA		Total (tpy)
	lb/hr	tpy	lb/hr	tpy	tpy
PM	0.53	0.99	0	0	0.99
PM <sub>10</sub>	0.49	0.92	0	0	0.99
PM <sub>2.5</sub>	0.43	0.82	0	0	0.99
Total HAP Metals	0.02	0.04	0.72	3.15	3.19

There are no federal regulations that establishes an emissions standard (i.e. MACT) that applies for these types of sources proposed in the permit determination request. The only state rule that these processes are subject to is Rule 7. Thus, both process would be subject to the process weight rate standard of 45 CSR 7-4.1. The Rule 7 allowable would be 2.7 pounds of PM per hour for the PAM process and 0.06 pounds of PM per hour for the EIGA process. These processes would meet the PM standard of Rule 7 without the use of any add-on control device.

The facility is cover by Permit R13-2877. The process permitted in R13-2877 is not related or depends on to these two processes. The potential of HAPs from the process in R13-2877 is only 188 pounds of HCL per year. Thus, the total HAP potential is less than the major source threshold level as defined in 40 CFR Part 63. Therefore, these new processes will not affect the facility status as an area source of HAPs.

These proposes sources do not meet the construction/modification threshold under Rule 13. Therefore, this writer recommends a no permit letter be issued in response to FMW permit determination request PD17-009.